

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Martin Haubner et al.

Application No.: 10/537,962

Confirmation No.: 1386

Filed: June 9, 2005

Art Unit: 1621

For: METHOD FOR THE PRODUCTION OF
TETRAHYDROFURAN COPOLYMERS

Examiner: Katakam, S.

APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

As required under § 41.37(a), this brief is filed within two months of the Notice of Appeal filed in this case on October 29, 2007.

The fees required under § 41.20(b)(2) are dealt with in the accompanying
TRANSMITTAL OF APPEAL BRIEF.

This brief contains items under the following headings as required by 37 C.F.R. § 41.37 and M.P.E.P. § 1206:

- I. Real Party In Interest
- II. Related Appeals and Interferences
- III. Status of Claims
- IV. Status of Amendments
- V. Summary of Claimed Subject Matter
- VI. Grounds of Rejection to be Reviewed on Appeal
- VII. Argument
- VIII. Claims

IX. Evidence
X. Related Proceedings
Appendix A Claims

I. REAL PARTY IN INTEREST

The real parties in interest for this appeal are:

BASF Aktiengesellschaft of Ludwigshafen, Germany

II. RELATED APPEALS, INTERFERENCES, AND JUDICIAL PROCEEDINGS

To the best of Applicants' knowledge, there are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 11 claims pending in application.

B. Current Status of Claims

1. Claims canceled: 0
2. Claims withdrawn from consideration but not canceled: 0
3. Claims pending: 1-11
4. Claims allowed: 0
5. Claims rejected: 1-11

C. Claims On Appeal

The claims on appeal are claims 1-11.

IV. STATUS OF AMENDMENTS

A Preliminary Amendment was filed on June 9, 2005. The claims appealed herein are the claims of record and considered in the Non-Final Office Action of January 3, 2007 and Final Office Action of June 7, 2007.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The claimed subject matter relates to a process for preparing polyoxyalkylene glycols. The process involves copolymerizing, in one stage, tetrahydrofuran and alpha, omega-diols with the exception of butanediol as the comonomer in the presence heteropolyacid and of a hydrocarbon, distilling off a mixture of water and the hydrocarbon from the copolymerization, and terminating the polymerization by adding water when a molecular weight of from 1,000 to 2,800 is attained. The independent claim involved in the Appeal is discussed at page 1, lines 38-39, page 2, lines 4-24, page 3, lines 19-20, and page 4, lines 19-30.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A rejection for review on Appeal is of claims 1-11 under 35 U.S.C. § 103(a) over EP 1 361 243 A1 to Kodama et al. ("Kodama") in view of U.S. Patent No. 5,395,959 to Weyer et al. ("Weyer").

VII. ARGUMENT

The claimed process for preparing polyoxyalkylene glycols is not *prima facie* obvious over Kodama and Weyer. An obviousness analysis under 35 U.S.C. § 103 requires, *inter alia*, consideration of the differences between prior art references and the claims at issue. *See KSR International Co. v. Teleflex Inc.*, 127 S.Ct. 1727 (2007) ("KSR") (citing *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17-18, 86 S.Ct. 684 (1966) ("Graham") (describing factors that control an obviousness inquiry)). In *Graham*, the U.S. Supreme Court ("Court") set forth the framework for applying the statutory language of 35 U.S.C. § 103, and in *KSR* the Court determined that the *Graham* factors were still useful and provided "helpful insight" to an obviousness inquiry. *KSR*, 127 S. Ct. at 1741. The Court further indicated that a "teaching, suggestion, motivation" to combine need not be explicit in every case. *Id.* (referring to a

mechanical device application, in which the Court determined that merely adding a previously existing sensor for detecting pedal movement to a previously existing adjustable throttle pedal was not inventive).

However, in making its obviousness determination, the Court indicated the importance of identifying a “reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.” *Takeda Chem. Indus., v. Alphapharm Pty. Ltd.*, 492 F.3d 1350, 1356-57 (Fed. Cir. 2007) (“*Takeda*”) (quoting KSR, 127 S. Ct. at 1731). In the recent chemical case *Takeda*, the U.S. Court of Appeals for the Federal Circuit (“Federal Circuit”) concurred with the Court’s reasoning by also emphasizing that “it remains necessary to identify some reason that would have led a chemist to modify a known compound in a particular manner to establish *prima facie* obviousness of a new claimed compound.” *Takeda*, 492 F.3d at 1357.

In the present case, the Office has not demonstrated that the cited references describe or suggest the claimed process, in light of the differences between the cited references and the claimed process; or articulated a reason that one skilled in the art would have been led to combine the references to achieve the claimed process.

A. The Disclosures of Kodama and Weyer Do Not Describe or Suggest the Claimed Process

The differences between the cited references and the claimed process are very apparent. For instance, in the claimed process, discussed *supra*, the process involves copolymerizing, in one stage, tetrahydrofuran (“THF”) and alpha, omega-diols with the exception of butanediol as the comonomer in the presence of heteropolyacid and of a hydrocarbon, distilling off a mixture of water and the hydrocarbon from the copolymerization, and terminating the polymerization by adding water when a molecular weight of from 1,000 to 2,800 is attained. *See* present claim 1. It is noted, as recited in the present specification, that molecular weight refers to number average molecular weight (M_n). *See* page 3, lines 26-27 of the present specification.

An aspect of the claimed process is to make the copolymerization of THF with alpha, omega-diols in the presence of heteropolyacids more simple and economic by providing copolymers of a certain molecular weight and finding a way of repeatedly using and recycling

the catalyst. *See id.* at page 1, lines 37-39. In particular, the claimed process allows a simple and reliable preparation of THF copolymers of a molecular weight of 1,000 to 2,800. *See id.* at page 3, lines 19-20.

The use of water in the claimed process, i.e., to terminate the copolymerization, makes possible not only synthesis of THF copolymers of certain molecular weights, but results in a heteropolyacid-containing catalyst phase which can be reused, e.g., by recycling. *See id.* at page 2, lines 11-15. This termination of the copolymerization results in an effectively stabilized heteropolyacid, which remains colorless, stable and catalytically active even on prolonged intermediate storage. *See id.* at lines 15-17. None of the cited references describe or suggest the claimed approach of copolymerization of THF.

Regarding Kodama, the reference generally describes an oxytetramethylene glycol copolymer having improved low temperature properties obtained by copolymerizing THF and neopentyl glycol, in which the oxytetramethylene glycol copolymer has a specific number average molecular weight, a specific molecular weight distribution and a specific neopentyl glycol compolymerization ratio. *See* page 2, para. [0001] of Kodama. The specific number average molecular weight may range from 800 to 5000. *See* page 5, para. [0018] of Kodama.

However, when Kodama is considered in its entirety, there is no description or suggestion of all of the process steps or above-described aspects or of the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984) (indicating that prior art references must be considered in their entirety, as a whole, including any disclosures that lead away from the claims at issue). Moreover, as acknowledged by the Office, Kodama fails to describe, *inter alia*, the claimed process step termination of polymerization reaction “by adding water.” Office Action dated January 3, 2007 at page 3, lines 5-18.

In particular, the process of Kodama involves subjecting THF and neopentyl glycol to a copolymerization reaction in the presence of a heteropolyacid catalyst, while “continuously removing from the reaction system water which is by-produced in the copolymerization reaction so that the amount of water is adjusted to a level wherein a two-phase reaction system is formed which comprises an organic phase comprising a solution of neopentyl glycol in [THF]”. *See* page 4, para. [0011] of Kodama. The reference further indicates that “when an unreacted diol is

distilled off from a reaction mixture containing an oxytetramethylene glycol copolymer and an unreacted diol in the presence of a fresh [THF] to thereby separate and purify the oxytetramethylene glycol copolymer, it becomes possible to not only purify the copolymer . . . but also recover a recyclable diol.” *See id.* As such, Kodama clearly is not concerned with the use of water to terminate the copolymerization or an effectively stabilized heteropolyacid.

Regarding Weyer, the reference generally describes a “process for adjusting the average molecular weight of polyoxyalkylene glycols and polyoxyalkylene derivatives in the heteropolyacid-catalyzed polymerization of cyclic ethers and/or acetals with ring cleavage in the presence of proton donors.” Column 1, lines 12-17 of Weyer. The average molecular weight of polyoxyalkylene glycols and polyoxyalkylene derivatives may be “from about 500 to 3,500 dalton.” *Id.* at column 2, lines 51-55.

As alleged by the Office, Weyer “teaches a process to produce a polymer having an average molecular weight of from about 500-3,500 dalton [col. 14, lines 27-30], and this reaction system is regulated in the course of reaction by the measurement of the electrical conductivity, which means electrical conductivity is related to molecular weight of polymer.” Office Action dated January 3, 2007 at page 4, lines 1-4. The Office thus concludes that, *inter alia*, it would have been obvious to “apply the method of [Weyer] to control the molecular weight of copolymer in the polymerization of [Kodama].” Office Action dated January 3, 2007 at page 4, lines 5-13.

However, Weyer does not describe or suggest *adding* water to the reaction mixture in order to *terminate* polymerization. To the contrary, Weyer describes adding water *before and/or during* the polymerization. *See* columns 11-12, Examples 1-3 of Weyer. In contrast, the presently claimed process relates to distilling water off the reaction mixture (i.e., removing water from the reaction mixture) *during polymerization*, and subsequently terminating polymerization by adding water. *See* present claim 1. As such, Weyer clearly does not describe the claimed invention or cure any the deficiencies of Kodama.

B. One Skilled in the Art Would Not Have Been Led to Achieve the Claimed Process

The Office has not articulated a reason why one skilled in the art would even consider modifying Kodama with Weyer, much less having been led to do so. In particular, as admitted

by the Office, “the examiner knew that [Kodama, when making the obviousness rejection] did not disclosure applicant’s process to terminate that polymerization reaction using water in order to obtain a copolymer having a desired molecular weight.” Office Action dated June 7, 2007 at page 2, para. 2. Yet, the Office has maintained the rejection since Weyer allegedly indicates that, *inter alia*, “the reaction system can be controlled by the addition of [a] proton donor.” *Id.* at page 3, lines 4-9.

However, Applicants point out that Weyer explicitly describes that in the reaction system “it is possible *continuously to measure and to control* the proton donor/heteropolyacid ratio in the reaction system as a whole and in the catalyst phase in particular.” Column 3, lines 54-57 of Weyer. (Emphasis added). Moreover, Weyer indicates that the molecular weight of the resulting polymer is controlled *in the course of the polymerization* reaction with the addition of the proton donor. *See id.* at column 3, line 63 through column, 4, line 5. Furthermore, as discussed *supra*, the examples of Weyer indicate that water is *added at the beginning* of the reaction and by *metered gradually during the reaction*.

As such, based on these explicit descriptions of the actual process of Weyer and the deficiencies of Kodama, there is no apparent reason to modify Kodama to achieve the claimed process. Such disclosures, as discussed *supra*, are entirely different and teach away from the claimed invention, which recites “*distilling off a mixture of water* and the hydrocarbon from the copolymerization, and *terminating the polymerization by adding water* when a molecular weight of from 1,000 to 2,800 is attained.” Present claim 1. (Emphasis added).

Further, other than the description and examples in the present specification, there is nothing that would have led one to modify either of the prior art references to distill off water and terminate polymerization in the manner presently claimed. In particular, in contrast to the cited references, Applicants have discovered that the claimed process provides unexpected benefits regarding the preservation of heteropolyacid catalyst. For instance, when the reaction is terminated *without adding water* (i.e., by switching off the heating), the recovered heteropolyacid phase became solid after 3 days, could no longer be recycled and could no longer be reused. *See Comparative Example 2 at page 12, lines 29-38 of the present specification.*

Therefore, the Office has not shown that the combined references describe or suggest the claimed invention, or even provided any explicit analysis of why one skilled in the art would be led to modify or combine the disclosures of the references.

Accordingly, in view of the above remarks and reasons explaining the patentable distinctness of the presently appealed claims over the prior art, Applicants request that the pending 35 U.S.C. § 103(a) rejection be reversed.

VIII. CLAIMS

A copy of the claims involved in the present appeal is attached hereto as Appendix A. As indicated above, the claims in Appendix A do include the amendments filed by Applicant on June 9, 2005.

IX. EVIDENCE

No evidence pursuant to §§ 1.130, 1.131, or 1.132 or entered by or relied upon by the examiner is being submitted.

X. RELATED PROCEEDINGS

None.

Dated: December 31, 2007

Respectfully submitted,

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APPENDIX A

Claims Involved in the Appeal of Application Serial No. 10/537,962

1. (Previously Presented) A process for preparing polyoxyalkylene glycols of comprising copolymerizing, in one stage, tetrahydrofuran and alpha, omega-diols with the exception of butanediol as the comonomer in the presence a heteropolyacid and of a hydrocarbon, distilling off a mixture of water and the hydrocarbon from the copolymerization, and terminating the polymerization by adding water when a molecular weight of from 1,000 to 2,800 is attained.
2. (Previously Presented) The process as claimed in claim 1, wherein between 0.1 and 10% by weight of water, based on the total amount of tetrahydrofuran, comonomer and heteropolyacid already used for the copolymerization, is added.
3. (Previously Presented) The process as claimed in claim 1, wherein the attainment of the molecular weight is determined by measuring the electrical conductivity of the copolymerization mixture.
4. (Previously Presented) The process as claimed in claim 1, wherein the water is added at a conductivity of from 0.1 to 5 μ S.
5. (Previously Presented) The process as claimed in claim 1, wherein the alpha, omega-diol used is neopentyl glycol.
6. (Previously Presented) The process according to claim 2, wherein the attainment of the molecular weight is determined by measuring the electrical conductivity of the copolymerization mixture.
7. (Previously Presented) The process according to claim 2, wherein the water is added at a conductivity of from 0.1 to 5 μ S.

8. (Previously Presented) The process according to claim 3, wherein the water is added at a conductivity of from 0.1 to 5 μ S.
9. (Previously Presented) The process according to claim 2, wherein the alpha, omega-diol used is neopentyl glycol.
10. (Previously Presented) The process according to claim 3, wherein the alpha, omega-diol used is neopentyl glycol.
11. (Previously Presented) The process according to claim 4, wherein the alpha, omega-diol used is neopentyl glycol.

Appendix B

EVIDENCE

NONE

Appendix C
RELATED PROCEEDINGS
NONE